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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/967,031	09/27/2001	Lokpraveen B. Mosur	2207/11305	4804
25693	7590	02/03/2005	EXAMINER	
KENYON & KENYON (SAN JOSE) 333 WEST SAN CARLOS ST. SUITE 600 SAN JOSE, CA 95110			MCLEAN MAYO, KIMBERLY N	
			ART UNIT	PAPER NUMBER
			2187	

DATE MAILED: 02/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/967,031	Applicant(s) MOSUR ET AL.	
	Examiner Kimberly N. McLean-Mayo	Art Unit 2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21-24 is/are allowed.
- 6) ☒ Claim(s) 1-4, 7-20 and 25-30 is/are rejected.
- 7) ☒ Claim(s) 5 and 6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. In view of the Appeal Brief filed on March 22, 2004, PROSECUTION IS HEREBY REOPENED. A detailed action is set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1 and 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Lubbers et al. (USPN: 5,761,501).

Regarding claim 1, Lubbers discloses an apparatus for cache flushing comprising a list structure to track a status of a plurality of cache entries (C 4, L 46-52; C 5, L 3-4), wherein the list structure is located outside a cache (C 4, L 19-25) and wherein the list structure does not contain

Art Unit: 2187

cache data or addresses (C 6, L 25-47); a query mechanism to check the list structure for the state of a cache entry and a cache flush mechanism, logically coupled to the list structure and the cache to flush the cache entry and for modifying the list structure to reflect a flushed state (C 10, L 17-21).

Regarding claims 11-12, Lubbers discloses the cache flush mechanism logically coupled to the main memory for evicting modified data (flushing)(C 10, L 18-22; this feature is inherent to a flush operation).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3, 7-14, 16-20, 25-27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watt (USPN: 6,272,033) in view of Lubbers (USPN: 5,761,501).

Regarding claims 1, 16, 25-27 and 29, Watts discloses a list structure for tracking the status of a plurality of cache entries, wherein the list structure is located outside of the cache and does not contain cache data or addresses (C 4, L 27-30, 51-54; the list structure is stored in a status bit RAM memory); and a query mechanism for checking the list structure for the state of a cache entry (C 4, L 64-67; C 5, L 1-2). Watts does not explicitly disclose a cache flush mechanism, logically coupled to the list structure and the cache to flush the cache entry and for modifying the

Art Unit: 2187

list structure to reflect a flushed state. Watts discloses that the list structure may be used to facilitate rapid cache flushes (C 5, L 13-17), however, Watts does not explicitly disclose a cache flush mechanism to implement such. However, Lubbers discloses a cache flush mechanism, logically coupled to the list structure and the cache to flush the cache entry [when a flush operation occurs, the system intrinsically write back dirty data and invalidates the cache lines] and for modifying the list structure to reflect a flushed state (C 10, L 17-21). It would have been obvious to one of ordinary skill in the art to use Lubbers teachings with the list structure taught by Watts for the desirable purpose of performing rapid cache flushes using the list structure.

Regarding claims 2, 17 and 19, Watts and Lubbers disclose the list structure containing one bit per cache line (Watts- C 4, L 27-28).

Regarding claims 3, 18 and 20, Watts and Lubbers disclose the list structure (list structure stored in the status bit register) comprising one bit per plurality of cache lines (Watts – C 4, L 56-61).

Regarding claim 7, Watts and Lubbers disclose the list structure matching an architecture of the cache (Watts - C 4, L 47-61).

Regarding claim 8, Watts and Lubbers disclose the cache flush mechanism modifying a cache state responsive to results of a query of the list structure (C 6, L 20-30).

Art Unit: 2187

Regarding claims 9-10, Watts and Lubbers do not disclose the cache flush mechanism logically coupled to a higher level cache for writing back modified data. However, it is well known in the art, when flushing a lower level cache, to write back modified data to higher levels of cache and to the main memory, [which effectively couples the higher level cache and the main memory to the flush mechanism], as disclosed by the Applicant in the background of the invention (page 3, line 20-21; page 4, lines 1-6) for the purpose of ensuring coherency. Therefore, it would have been obvious to one of ordinary skill in the art to write back modified data to a higher level cache, thereby coupling a cache flush mechanism to the higher level cache, for the desirable purpose of coherency.

Regarding claims 11-12, Watts and Lubbers discloses the cache flush mechanism logically coupled to the main memory for evicting modified data (flushing)(Lubbers - C 10, L 18-22; this feature is inherent to a flush operation).

Regarding claims 13-14, Watts and Lubbers disclose the list structure located on a die in a random access memory (RAM) (Watts - C 4, L 28-31).

Regarding claim 30, Watts and Lubbers do not disclose the cache flush mechanism logically coupled to a higher level cache for writing back modified data. However, it is well known in the art, when flushing a lower level cache, to write back modified data to higher levels of cache and to the main memory, [which effectively couples the higher level cache and the main memory to the flush mechanism], as disclosed by the Applicant in the background of the invention (page 3,

Art Unit: 2187

line 20-21; page 4, lines 1-6) for the purpose of ensuring coherency. Therefore, it would have been obvious to one of ordinary skill in the art to write back modified data to a higher level cache, thereby coupling a cache flush mechanism to the higher level cache, for the desirable purpose of coherency.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watts (USPN: 6,272,033) and Lubbers (USPN: 5,761,501) as applied to claim 1 above and further in view of McDermott (USPN: 5,860,105).

Watts and Lubbers disclose the limitations cited above however, they do not disclose the list structure comprising one bit per cache way. However, McDermott teaches a list structure comprising one bit per cache way (C 9, L 35-37). This feature taught by McDermott provides rapid cache flushing by determining if an entire set is clean or dirty by checking one bit.

Hence, it would have been obvious to one of ordinary skill in the art to use the system taught by Watts and Lubber in a N-way associative cache wherein each way has a status bit indicating its status for the desirable purpose of efficiency and improved performance.

7. Claims 15 and 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watt (USPN: 6,272,033) in view of Lubbers (USPN: 5,761,501) as applied to claims 1 and 25 and further in view of Stevens (USPN: 5,724,550).

Watt and Lubbers disclose the limitations cited above in claims 1 and 25, however, they do not disclose querying the list structure in response to a snoop command. However, Stevens teaches the concept of querying a list structure (structure which indicates the state, such as

Art Unit: 2187

modified/dirty, of a cache line) to determine the status of a cache line in response to a snoop command (C 7, L 32-44) to ensure the correct copy of data is retrieved by a requesting device (C 1, L 49-67; C 2, L 1). Hence, it would have been obvious to one of ordinary skill in the art to use Stevens' teachings with the system taught by Watt and Lubbers, in an environment providing shared access to cache lines, for the desirable purpose of accuracy.

Allowable Subject Matter

8. Claims 5-6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. Claims 21-24 are allowed.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimberly N. McLean-Mayo whose telephone number is 703-308-9592. The examiner can normally be reached on Tues, Thr, Fri (10:00 - 6:30).

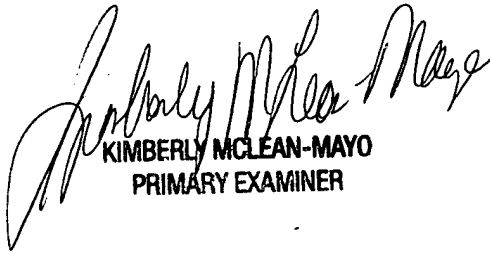
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 703-308-1756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2187

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KNM

January 20, 2005



KIMBERLY MCLEAN-MAYO
PRIMARY EXAMINER

Kimberly N. McLean-Mayo
Examiner
Art Unit 2187